U.S. Department
of Transportation

Federal Highway Administration

DWIGHT DAVID EISENHOWER TRANSPORTATION FELLOWSHIP PROGRAM

2003 GRANTS FOR RESEARCH FELLOWSHIPS ANNOUNCEMENT

CONTENTS

OBJECTIVES OF THE PROGRAM

This announcement is for the **EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS** which is one of six award categories of the DWIGHT DAVID EISENHOWER TRANSPORTATION FELLOWSHIP PROGRAM. The objectives of the overall Program are to attract the nation's brightest minds to the field of transportation, to enhance the careers of transportation professionals by encouraging them to seek advanced degrees, and to retain top talent in the transportation industry of the United States. The Program is intended to help upgrade the scope of knowledge of the entire transportation community in the United States and encompasses all modes of transportation.

The six fellowship award categories are:

Eisenhower Graduate Fellowships to enable students to pursue Master's Degrees or Doctorates in transportation-related fields.

Eisenhower Grants for Research Fellowships (GRF) to acquaint undergraduate and graduate students with transportation research, development and technology transfer activities at the U.S. Department of Transportation.

Eisenhower Historically Black Colleges and Universities (HBCU) Fellowships to provide HBCU students with additional opportunities to enter careers in transportation.

Eisenhower Hispanic Serving Institutions (HSI) Fellowships to provide HSI students with additional opportunities to enter careers in transportation.

Eisenhower Faculty Fellowships to provide talented faculty in transportation fields with opportunities to improve their transportation expertise, by attending conferences, courses, seminars or workshops.

Eisenhower Tribal Colleges Initiatives whose purpose is to identify transportation-related activities and provide student and faculty fellowship opportunities at Tribal Colleges.

As mentioned earlier, this announcement is for the **Eisenhower Grants for Research Fellowships (GRF)** which is one of six award categories of the Dwight David Eisenhower Transportation Fellowship Program. The objectives of the Grants for Research Fellowships are to acquaint talented students with transportation research, development and technology transfer activities by providing them with an opportunity to conduct research on important transportation topics **at U.S. Department of Transportation (DOT) facilities.** The Department of Transportation encourages students from Historically Black Colleges and Universities (HBCUs) and Hispanic Serving Institutions (HSIs) to apply for the Grants for Research Fellowships.

ELIGIBILITY REQUIREMENTS

Nominees of the Eisenhower Grants for Research Fellowships must be enrolled in an accredited U.S. institution of higher education, must be pursuing a degree in a full-time program, must be in a transportation-related discipline and should be planning to enter the transportation profession after completing their higher level education.

Grants for Research Fellowships are intended for:

- Students who are in their Junior year toward a Baccalaureate Degree, but will complete their Junior year **before being awarded** a fellowship.
- Students who are in their Senior year toward a Baccalaureate Degree; and
- Students who have completed their Baccalaureate Degree and are enrolled in a program leading to a Masters, Ph.D. or equivalent Degree.

NOMINEE'S RESEARCH PROJECT

Nominees must select one or more projects from the List of Candidate Research Projects contained in this announcement. If chosen, the GRF recipient will conduct the research **(full-time) at one of the DOT facilities in the Washington DC Metropolitan area** unless otherwise specified in the announcement. Each selectee must have a Faculty Advisor assigned to provide academic supervision. Technical direction on the research project will be provided by a DOT Technical Advisor. GRF selectees will normally receive academic credit from their university for the research project. The amount of academic credit will be determined by the Faculty Advisor.

CRITERIA FOR EVALUATION

The Eisenhower Grants for Research Fellowships will be awarded on the basis of merit. Evidence of merit will include:

- Match of the student's qualifications with the proposed research project, including the student's ability to accomplish the project in the available time;
- Recommendation letters regarding the nominee's qualifications to conduct the research;
- Academic records, including class standing, GPA and transcripts, and
- Transportation work experience, if any, including employer's endorsement.

SELECTION

The nominees will be evaluated by the Eisenhower Grants for Research Fellowships Review Panel. This panel will be composed of transportation professionals and will be convened in Washington, D.C. Each nominee's qualifications will be reviewed carefully by the panel.
The recommendations for selection will be ranked in merit order and furnished to the DOT operating administration sponsoring the Grants for Research Fellowships project. Final selections will be made by the Director of the National Highway Institute.

TENURE

The tenure for an Eisenhower Grants for Research Fellowships recipient is normally three, six, nine, or twelve months.

STIPEND, TUITION AND TAXES

Fellowship recipients should be advised that **the stipend portion of the fellowship is subject to taxation** by the Internal Revenue Service (IRS).

The stipend for the Eisenhower Grants for Research Fellowships are as follows:

- College Senior $1,450/mo.
- Master's Level $1,700/mo.
- Doctoral Level $2,000/mo.

Tuition and fees that relate to the academic credits for the approved research project will be paid in full. Grants for Research Fellowships recipients will be paid a travel allowance for a reasonable cost of travel to and from the U.S. Department of Transportation facility where they will conduct the research. Faculty Advisors will be allowed one site review on projects which last over six months. Faculty Advisors will be allowed two site reviews for projects over nine months. Faculty Advisors will be allowed travel and per diem for each visit to the DOT facility to perform a site review with their student.

Restrictions on the use of fellowship funds are as follows:

- No dependency allowances;
- No reimbursement of university administrative/
- indirect costs;
- GRF selectees are eligible for funding only during those months in which they are conducting (**full-time)** research at a DOT facility or another approved facility;
- Grants for stipend, tuition and other costs will be executed between the DOT operating administration and the university on behalf of the student by the Director, Universities & Grants Programs;
- The recipient's university has the responsibility of administering the funds and for making periodic payments to the recipient; and
- Unused funds must be returned to the Federal Highway Administration/National Highway Institute (FHWA/NHI) within 30 days of the termination of the fellowship.

CONDITIONS OF ACCEPTANCE

A major change in the research topic or an extension in time to complete the research must be approved by the Director, Universities & Grants Programs. Grants for Research Fellowship recipients must conduct original research and prepare a paper or report suitable for publication on the topic for which they are selected. Recipients must make the results of their research available to the U.S. Department of Transportation (DOT) and the Department will retain an unlimited royalty-free privilege to use the results of the research.

Recipients are responsible for finding their own housing accommodations when they arrive at the DOT facility. Some of the DOT facilities may require use of an automobile for commuting purposes.

SCHEDULE

Nominations for Eisenhower Grants for Research Fellowships will remain open until the positions are filled. Send the nomination to the address in the section on "How to Apply".

Potential selectees under the Grants for Research Fellowships will be contacted in writing to determine acceptance of the award. Once the award has been made, recipients may begin conducting research at a DOT facility as early as **July 9**, **2003.** Each fellowship will be awarded to the university on behalf of the student approximately thirty (30) days prior to the start date.

HOW TO APPLY

Nominees for the Eisenhower Grants for Research Fellowships must submit their nominations through their Faculty Advisors and be nominated for fellowship awards by their respective universities. Grants for Research Fellowships nominations and supporting materials must be submitted to the following address:

Send to:
Dr. Ilene D. Payne, Director
Universities & Grants Programs
National Highway Institute, HHI-20
Federal Highway Administration
4600 N. Fairfax Drive, Suite 800
Arlington, VA 22203
TEL: (703) 235-0538
FAX: (703) 235-0593
http:\\www.nhi.fhwa.dot.gov

General Instructions: Please read the Eisenhower Grants for Research Fellowships Announcement and these instructions before preparing the nomination materials. Nominees must submit **one original (with signatures) and six copies of all materials.** ***All materials must be typed.***

Students should request that an official transcript be sent to the above address; however, a copy may be accepted pending receipt of the official transcript.

Complete Nomination: A completed nomination must be typed and will consist of:

- **Eisenhower Grants for Research Fellowships Nomination (Parts 1-4);**
- **Academic records, including certified transcripts, class standing and GPA;**
- **Three recommendations and/or employer's endorsement letters; and**
- **Resume.**

It is permissible to use copies of the nomination form.

Nomination - Part 1: All requested information must be provided unless labeled "optional". If an item is not available, state "NA". The nomination must be signed and dated in dark ink.

Nomination - Part 2: List only those universities where a degree was obtained. List only those employers where a transportation function was performed. Each nominee must have at least three recommendation and/or endorsement letters. The letters must be received at the address under "How To Apply". If you are currently employed in a transportation function, it is imperative that your employer submit an endorsement letter. The recommendation and endorsement letters should contain the length and nature of the person's relationship with the nominee and comments on the nominee's overall ability, suitability for graduate school and potential for major contributions in one or more areas of transportation.

Nomination - Part 3: Part 3 should display the nominee's ability to communicate well and demonstrate the intent to pursue a career in transportation. The nominee should relate research plans and career goals. Part 3 should be limited to two pages.

Nomination - Part 4: Nominees will use Part 4 to indicate their selected research projects. A total of three projects may be selected, starting with the nominee's first preference. Number each selected project accordingly (1, 2 and 3).

Mailing the Nomination: When possible, nominees are urged to submit nominations and supporting documents in the same envelope. Universities are permitted to send transcripts directly to the address shown in the "How To Apply" section.

RETURN OF MATERIALS: Neither the nomination nor the materials submitted in support of an nomination will be returned to an nominee.

DWIGHT DAVID EISENHOWER TRANSPORTATION FELLOWSHIP PROGRAM
2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS
U.S. DEPARTMENT OF TRANSPORTATION
WASHINGTON, D.C.

Nomination Form - Part 1 *Must be typed*

<table>
<tr><td colspan="2">Name</td><td>Social Security Number
- -</td></tr>
<tr><td colspan="2">Current Address</td><td>Tel. No. ( )
E-mail Address

Fax No. ( )</td></tr>
<tr><td colspan="2">Permanent Address</td><td>Telephone Number
( )</td></tr>
<tr><td colspan="2">Check one box to indicate your current status:
❑ College Senior ❑ Master's Student ❑ Doctoral Student</td><td rowspan="2">Ethnicity (optional)
❑ Amer. Indian/Alaska Native
❑ Asian/Pacific Islander
❑ Black, not Hispanic
❑ Hispanic
❑ White, not of Hispanic origin

Puerto Rico Only
❑ Hispanic
❑ Not Hispanic in Puerto Rico</td></tr>
<tr><td colspan="2">U.S. Citizen If No, furnish evidence of your intent to become a citizen.

❑ Yes ❑ No</td></tr>
<tr><td>Date of Birth

__ __ __ __ __ __
M M D D Y Y</td><td>Gender:
❑ Male
❑ Female</td><td></td></tr>
</table>

<table>
<tr><td colspan="2">Nominating College or University/Acad. Dept.</td></tr>
<tr><td>Name and Address of Faculty Advisor</td><td>Tel. Number: ( )
E-mail Address:
Fax Number: ( )</td></tr>
<tr><td colspan="2">Nominee's Major, Minor and Credit Hours Earned in Each</td></tr>
</table>

<table>
<tr><td>Date</td><td>Signature of Nominee (Required)</td></tr>
<tr><td>Date</td><td>Signature of Faculty Advisor (Required)</td></tr>
</table>

DWIGHT DAVID EISENHOWER TRANSPORTATION FELLOWSHIP PROGRAM
2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS
U.S. DEPARTMENT OF TRANSPORTATION
WASHINGTON, D.C.

Nomination Form - Part 2

Colleges/Universities Attended	Dates Attended	Degrees Earned	Date Awarded

Employer (most recent first)	Address	Dates of Employment

Names & Addresses of persons submitting recommendation/endorsement
1.
2.
3.
4.

List Academic Honors, Scholarships, Offices Held in Student/Professional Organizations, etc.

DWIGHT DAVID EISENHOWER TRANSPORTATION FELLOWSHIPS PROGRAM
2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS
U.S. DEPARTMENT OF TRANSPORTATION
WASHINGTON, D.C.

Nomination Form - Part 3

POTENTIAL FOR OUTSTANDING ACHIEVEMENT

State how you qualify to perform each research project that you have selected. Draw upon your educational, personal and work experience; accomplishments; volunteer activities; and events in your life relevant to the research projects. Explain how conducting research on one of these projects will help you reach your professional career goals. The overall statement should reflect your ability to communicate skillfully, creatively and concisely.

DWIGHT DAVID EISENHOWER TRANSPORTATION FELLOWSHIPS PROGRAM
2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS
U.S. DEPARTMENT OF TRANSPORTATION
WASHINGTON, D.C.

Nomination Form - Part 4

RESEARCH PROJECTS SELECTION

Read the descriptions of the following projects and select up to three projects which are of interest to you. Mark "1", "2", and "3" in the boxes to indicate your first, second and third preferences. Except as noted, only one student will be selected per project.

[ ] 1. Assessment of Traffic Volume Trend Algorithms

[ ] 2. Moisture Sensitivity of Asphalt-Aggregate Systems

[ ] 3. Highway Traffic Noise

[ ] 4. The Air Quality/Transportation Link to the State Implementation

[ ] 5. Design and Spacing of Speed Humps **[Fellowship has been filled]**

[ ] 6. Sign & Pavement Marking Retroreflectivity

[ ] 7. Fiscal Constraint in Transportation Planning

[ ] 8. International Planning

[ ] 9. Community-Based Transportation Programs **[Fellowship has been filled]**

[ ] 10. Benefit Analysis of the Appraisal Review Process for the Acquisition of Real Property for Federally Funded Projects

[ ] 11. Modeling the Permeability of Asphalt Pavements

[ ] 12. Relating the Microstructure Properties of Asphalt Mixes to Macroscopic Response **[Fellowship has been filled]**

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS
CANDIDATE PROJECT No. 1

TITLE OF PROJECT: Assessment of Traffic Volume Trend Algorithms

SPONSOR: Office of Highway Policy Information, Federal Highway Administration

LENGTH OF ASSIGNMENT: 6 – 9 months

DISCIPLINE: Planning, Traffic Engineering, Operations Research, Statistics, Economics

PREREQUISITES: Master's Candidate

DESCRIPTION OF ASSIGNMENT: Since the 1930's, FHWA has developed estimates of the Nation's traffic volume trends each month. The data are used as a measure of economic activity and provide exposure information necessary in assessing the effectiveness of safety programs. The estimation process is based on changes in traffic at permanent traffic counters operated by the various States. While conceptually straightforward, the actual reporting process must be sufficiently robust to deal with various data anomalies such as interpolating missing hourly and daily values due to counter malfunction or estimating trends in those States that may not report data during a month. The assignment will require a review of the current process, identification of possible improvements and implementation of a subset of such improvements. The assignment will also assess the feasibility of extending the process to provide estimates of heavy truck activity. The current estimate is avaible at http://www.fhwa.dot.gov/ohim/tvtw/tvtpage.htm

ACADEMIC CREDIT: 6 – 12 credits

OUTPUT/PRODUCT: A series of related work products would develop including identification of those phases of the estimation process that address data anomalies, documentation of how the data are processed in those phases, critique the reasonableness of the current approach and suggest alternative methods. From among those phases that might be improved, the research fellow will recommend those improvements that would be most beneficial to improving the overall estimation process as well as supporting the estimation of heavy truck activity. FHWA staff will then select those improvements that will be addressed by the research fellow through the development of fully documented process designs.

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS
CANDIDATE PROJECT 2

TITLE OF PROJECT: Moisture Sensitivity of Asphalt-Aggregate Systems

SPONSOR: Federal Highway Administration

LENGTH OF ASSIGNMENT: 12 months

DISCIPLINES: Chemistry, Material Sciences/Engineering, Chemical Engineering

PREREQUISITES: Masters or Doctoral Candidate

DESCRIPTION OF ASSIGNMENT: Moisture induced damage to asphalt pavements is largely underreported. This damage is often attributed to rutting and fatigue distress mechanisms. There are a host of mechanisms ascribed to moisture damage that have to be critically examined at the fundamental level. The following examples help illustrate the diversity of mechanisms that may be operating alone or together on a given pavement. The dissolution of aggregate components can lead to raveling and fatigue cracking; binder plasticization can soften the binder and lead to rutting, and chemical species may form which behave as soaps or emulsions that readily strip. Confirming and or refuting the various mechanisms is necessary if success is to be achieved in developing specifications or tests for screening moisture susceptible materials.

There is an ongoing quest to develop a single screening tool for evaluating moisture damage in the mix. Most of these approaches attempting to accelerate this damage in the mix have met with little success. However, one technique, the use of ultrasound, shows promise and has not been fully explored.

This assignment is to address one or more of the noted topics.

ACADEMIC CREDITS: 9-12 credits

OUTPUTS/PRODUCTS: One outcome from this research will be a draft procedure for screening out moisture susceptible materials. Anticipate that the cornerstones for developing additional screening tools will be in place at the conclusion of this assignment.

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS
CANDIDATE PROJECT No. 3

TITLE OF PROJECT: Highway Traffic Noise

SPONSOR: Federal Highway Administration

LENGTH OF ASSIGNMENT: 9 - 12 months

DISCIPLINES: Engineering, Acoustics, Physics, and Environmental Studies

PREREQUISITES: Master's Candidate

DESCRIPTION OF ASSIGNMENT: To improve overall highway traffic noise analysis and abatement program management and to increase the uniformity and consistency of traffic noise abatement decision-making, the FHWA has required all State Departments of Transportation (DOTs) to develop written State noise policies. The policies have been tailored and developed to address specific characteristics of individual state highway programs. Thus, while generally conforming to the requirements of 23 CFR 772, the policies contain variations in approach and content. This assignment would help FHWA better administer its responsibilities in the highway traffic noise program.

ACADEMIC CREDITS: 6 - 12 credits

OUTPUTS/PRODUCTS: The major work product would be development of an analysis and evaluation of currently approved written State noise policies. A report would be prepared to highlight the strengths of the state policies, as well as areas where improvements could be made. The emphasis would be on illustrating the use of flexibility in the consistent and uniform application of the requirements of 23 CFR 772.

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS
CANDIDATE PROJECT No. 4

TITLE OF PROJECT: The Air Quality /Transportation Link to the State Implementation Planning (SIP) Process

SPONSOR: Federal Highway Administration

LENGTH OF ASSIGNMENT: 9-12 months

DISCIPLINE: Planning (Environment and/or Transportation); Public Policy or related areas

PREREQUISITE: Masters Degree candidates with at least a B.S. in a related field, and must have a basic understanding of the SIP process.

DESCRIPTION OF ASSIGNMENT: The State Implementation Planning (SIP) process is the most important process that air quality analyst may encounter. The SIP, which is required under the Clean Air Act, must be submitted by the State detailing how it will meet the National Ambient Air Quality Standards (NAAQS). The SIP establishes emissions budget, which sets the total allowable emissions for each non-attainment and maintenance area for the purpose of attaining the NAAQS by a certain date through the use of different types of control measures. The motor vehicle emissions budget, as defined in the SIP, is the portion of the total emissions budget allocated to on-road vehicle use and emissions. It is therefore important for transportation professionals to be familiar with and actively involved in the SIP process so that transportation contribution to air pollution can be accurately represented.

The purpose of this study is to assess the role of transportation sector plays in the SIP process including the assumptions used in the development of the budget; the development of TCMs, to identify institutional and technical barriers to greater integration of the transportation and air quality planning processes; and to analyze the relative effectiveness and contribution of the transportation sector to air pollution reduction.

The study will involve interviews or surveys as part of the data collection phase.

ACADEMIC CREDIT: 12 months

OUTPUT/PRODUCTS: Oral presentation and final report

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIP CANDIDATE PROJECT No. 5
[Fellowship has been filled]

TITLE OF PROJECT: Design and Spacing of Speed Humps

SPONSOR: Federal Highway Administration

LENGTH OF ASSIGNMENT: 9 - 12 months

DISCIPLINES: Civil Engineering, Mechanical Engineering

PREREQUISITES: Master's Candidate

DESCRIPTION OF ASSIGNMENT: The goal of this project is to determine speed hump designs that will be suitable on streets with a broad range of desired speeds including higher order roads. Speed data will be collected on a large number of streets in the Washington metro area with a variety of speed hump designs and spacing. Both cross-sectional analysis and before and after studies will be conducted to determine the effects of hump design and spacing on crossing speeds and speed between humps. Vertical acceleration in various vehicle types will be measured to determine the acceptable levels corresponding to observed crossing speeds and compared to results from a vehicle dynamic model. If valid, the vehicle dynamics model will be used to determine the optimum design of speed humps for different desired speeds.

ACADEMIC CREDITS: 6 - 12 credits

OUTPUTS/PRODUCTS: The major work product will be development of optimal designs of speed humps and a model for predicting crossing speed and speed between humps based on hump size and spacing. The work will be documented in a paper suitable for publication in a technical journal. In addition the student will prepare and give an oral presentation of the results.

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIP CANDIDATE PROJECT No. 6

TITLE OF PROJECT: Sign & Pavement Marking Retroreflectivity

SPONSOR: Federal Highway Administration

LENGTH OF ASSIGNMENT: 9 - 12 months

DISCIPLINES: Civil Engineering, Human Factors

PREREQUISITES: Master's Candidate

DESCRIPTION OF ASSIGNMENT: The goal of this project is to aid the implementation of new FHWA requirements for traffic sign and pavement marking retroreflectivity and color through efforts in one or more of the following areas: (1) conduct further analyses of critical factors, (2) develop and test field procedures, and (3) assess the impacts associated with implementation. There is the need to study the performance of various sign and marking materials, enhance analytic models (e.g., CART, CARVE, TARVIP), and establish methods for lab and field measurement of properties of sign and marking materials. Further to promote the implementation of the requirements, it is necessary to formulate alternative field procedures for ascertaining adequate night visibility, develop the associated guidelines and criteria for their use, field test the methods, and prepare user-oriented materials to facilitate their use. Efforts to develop field procedures would begin by documenting practices in state and local agencies. Using effective practices as models, the specific guidelines and criteria necessary to assess retroreflectivity and color would be developed. For example, tests of headlight output and observer visual acuity might be devised to establish ranges of precision for use with legibility distance methods. The role of inventory systems and asset management strategies would be considered in procedure development. Further, the impacts associated with the implementation of various methods might be reviewed (e.g., what is the optimal inspection or replacement cycle relative to material service life, what are the marginal costs associated with incremental changes in performance factors, would a combination of methods work best) using life cycle costing or other methods. The research could also evaluate sign and marking placement criteria relative to the influence of headlights, viewer position, and driver visual acuity. Research is also needed to determine the actual colors associated with products on the market, the factors that influence the color, changes over time, and possibly driver capabilities to perceive color differences under varying conditions. Lab and field studies in both photometrics and human factors are needed to establish criteria for evaluating sign and marking color. The specific nature of the project would be defined considering the skills and interests of the candidate.

ACADEMIC CREDITS: 6 - 12 credits

OUTPUTS/PRODUCTS: The major work product will be development of criteria and procedures for the evaluation of the retroreflectivity and color of traffic signs and markings. The work will be documented in a paper suitable for publication in a technical journal. In addition the student will prepare and give an oral presentation of the results. Research would be highly useful to agency decision making and the implementation of new FHWA requirements for retroreflectivity and color.

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIP CANDIDATE PROJECT No. 7

TITLE OF PROJECT: Fiscal Constraint in Transportation Planning

SPONSOR: Federal Highway Administration, Office of Intermodal and Statewide Programs

LENGTH OF ASSIGNMENT: 9 - 12 months

DISCIPLINES: Planning, Sociology, Economics, International Business

PREREQUISITES: Master's Candidate

DESCRIPTION OF ASSIGNMENT: The FHWA advocates a sound transportation planning process that involves a variety of parties. The requirements for this process stem from legislation which requires States to develop plans and transportation improvement programs in order to use the Federal-ail highway funding. Within the requirements is an expectation that these plans and programs would be fiscally constrained. While there is general acceptance by the FHWA and its partners of the concept, and several documents are available that could be used as "guidance" little is actually put in practice regarding best ways for such plans to be fiscally constrained. Thus, the FHWA has an internal review underway to address "fiscal constraint" with the ultimate expectation of easily understood and user friendly tools and guidance.

ACADEMIC CREDITS: 6 - 12 credits

OUTPUTS/PRODUCTS: The major work product would be development of tools and guidance for what works and what does not for the FHWA and its partners to use to address fiscal constraint. This might include developing the basis for training, analysis of existing methods and procedures to evaluate effectiveness as well a documenting findings from the on-going review and how they may be used to create the needed guidance.

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIP CANDIDATE PROJECT No. 8

TITLE OF PROJECT: International Planning

SPONSOR: Federal Highway Administration, Office of Intermodal and Statewide Programs

LENGTH OF ASSIGNMENT: 9 - 12 months

DISCIPLINES: Planning, Sociology, Economics, International Business

PREREQUISITES: Master's Candidate

DESCRIPTION OF ASSIGNMENT: FHWA has a responsibility to work to continuously improve the economic efficiency of the nation's transportation system in order to enhance America' s position in te global economy. Several programs are underway to achieve this goal. Among them are work to improve the planning and coordination of activities at our country's border so that bottlenecks are removed, safety is assured and goods and people can move as freely as possible. Several groups and committees often join together to improve the border planning processes through joint research and exchange of information. However, much of this work involves assumptions that seem to rest on border activities and institutions remaining relatively unchanged with little emphasis on the types of work needed to be done now to ensure the best future possible.

ACADEMIC CREDITS: 6 - 12 credits

OUTPUTS/PRODUCTS: The major work product would be development of specific guidance and/or tools for FHWA and its partners to use to address future border planning and coordination issues. This might included putting together the foundation for a futures forum for the organizations involved to jointly agree on a preferred future view. This would entail investigation a series of options, developing a practicable recommendation and documenting the results.

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIP
CANDIDATE PROJECT No. 9
[Fellowship has been filled]

TITLE OF PROJECT: Community-Based Transportation Programs

SPONSOR: Federal Highway Administration

LENGTH OF ASSIGNMENT: 9 - 12 months

DISCIPLINES: Planning, Sociology, Management

PREREQUISITES: Master's Candidate

DESCRIPTION OF ASSIGNMENT: FHWA has a responsibility for providing tools and resources to facilitate maximum involvement in the transportation decisionmaking process at all levels of government. Communities are active partners in the transportation planning process. However, many planning tools are currently developed for the use of transportation professionals. There is a need for the development of a resource guide for community-based planning tools and resources. To date, the Transportation and Community and System Preservation Pilot Program have funded 199 projects across the country. Many of these projects will provide useful tools to facilitate transportation and community and system preservation. There is need to develop case studies, articles, publications highlighting these projects and community based tools and resources that are developed in conjunction with these efforts. There is also a need to identify avenues for disseminating this information to other organizations and communities.
ACADEMIC CREDITS: 6 - 12 credits

OUTPUTS/PRODUCTS: The major work product would be development of case studies, articles other publications to highlight community-based planning and implementation projects that are underway across the country. This might also include developing a resource guide for other sources of community-based planning information and tools. This effort may also include participation in the development and implementation of an outreach strategy for disseminating these products.

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS
CANDIDATE PROJECT NO. 10

TITLE OF PROJECT: Benefit analysis of the Appraisal Review Process for the Acquisition of Real Property for Federally Funded Projects

SPONSOR: FHWA – Office of Real Estate Services

LENGTH OF ASSIGNMENT: 3-6 months

DISCIPLINES: Social Sciences, Business Administration, Real Estate

PREREQUISITES: Master's Degree Candidate

DESCRIPTION OF ASSIGNMENT: Real property to be acquired from private property owners for federally funded projects must be appraised to determine the fair market value. Currently, FHWA and other Federal agencies require all appraisal products to be reviewed for accuracy, conformance with appraisal standards, and the appropriate determination of fair market value. Recently, questions have been raised about the utility of the process and its effect on the determination of fair market value. Research would involve visiting several State Transportation Departments, and, possibly, some Federal agencies, to review files and interview staff to determine the utility of the appraisal review process.

Research would determine whether the review process is being used appropriately, the necessity for review of particular classes of property such as residential, and the effect of the review process on the fair market value determination.

ACADEMIC CREDITS: 3-6 credits

OUTPUTS/PRODUCTS: The research study would result in a guidance document to be used initially by FHWA for policy determination, but would have potential for distribution to other Federal agencies engaged in property appraisal, as well as publication in national magazines such as the International Right of Way Association magazine and the Appraisal Journal. Additional use of research would be dependent on FHWA's analysis.

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS CANDIDATE PROJECT No. 11

TITLE OF PROJECT: Modeling the Permeability of Asphalt Pavements

SPONSOR: Federal Highway Administration

LENGTH OF ASSIGNMENT: 9 – 12 months

DISCIPLINE: Civil Engineering

PREREQUISITE: Masters Degree candidates with at least a B.S. in Civil Engineering.

DESCRIPTION OF ASSIGNMENT: Asphalt pavements constitute an integral part of the infrastructure of our nation. They are a complex system with layers of bound and unbound granular materials exposed to combinations of irregular traffic loading and varying environmental conditions. One of the most important factors controlling pavement performance is the ability of its layers to drain excess water out of the pavement system. Drainage of asphalt pavements is mainly controlled by the permeability of asphalt concrete and base layers underneath. High permeability of the asphalt pavements encourages stripping of the asphalt from the aggregate particles. It also endangers the base course by developing excess water underneath the asphalt concrete layer. This in turn leads to excessive deflection, cracking, and reduction in load carrying capacity of pavements.

Permeability of asphalt concrete is due to the presence of air voids in the mixture. Therefore, most current designs relate permeability to air void percentage. However, specimens with the same total volume of air voids may have different distribution and connectivity of air voids. These specimens may not be expected to have the same permeability values and fluid flow characteristics. Size distribution and connectivity of air voids are key factors that must be considered in addition to the total volume of voids. The complexity of describing the distribution of sizes and connectivity of air voids within the pavement has prevented the development of realistic model of pavement permeability. The recent advances in image processing of microstructures and computational modeling have, however, led to the development of tools that can be used to better describe distribution of sizes and connectivity of air voids and develop realistic models of pavement permeability.

The principal objective of this study is aimed at modeling fluid flow through the material microstructure as captured using an x-ray computed tomography (CT) system. The first task will be to capture the three-dimensional microstructure of asphalt concrete using x-ray computed tomography. The second task will be to develop a numerical solution to the complete set of equations that represent fluid flow in the material microstructure. The air void distribution in the X-ray Computed tomography images will be quantified and related to the computed permeability. Finally, the model will be validated by laboratory and field measurements of permeability.

ACADEMIC CREDIT: 6 - 12 credits

OUTPUT/PRODUCTS: Oral presentation and final report

2003 EISENHOWER GRANTS FOR RESEARCH FELLOWSHIPS CANDIDATE PROJECT No. 12

[Fellowship has been filled]

TITLE OF PROJECT: Relating the Microstructure Properties of Asphalt Mixes to Macroscopic Response

SPONSOR: Federal Highway Administration

LENGTH OF ASSIGNMENT: 9 – 12 months

DISCIPLINE: Civil Engineering

PREREQUISITE: Masters Degree candidates with at least a B.S. in Civil Engineering.

DESCRIPTION OF ASSIGNMENT: Asphalt concretes are composite materials consisting of aggregates, asphalt binder and air voids. Their constitutive behavior is defined by the interaction of two drastically different materials having moduli several orders of magnitude apart. A further complication in describing their behavior is the viscoelastic nature of the binder and its dependency on temperature, loading frequency, and strain magnitude.

Significant progress has been made recently in characterizing the viscoelastic properties of asphalt binders through procedures established by *Superpave*™ (Superior Performing Asphalt Pavements) (1996). Two main tests are used for this purpose, namely the Bending Beam Rheometer (BBR) and the Dynamic Shear Rheometer (DSR). These two tests provide direct measurements of binder stiffness under creep loading and shear modulus/phase angle under sinusoidal shear loading, respectively. The effects of temperature and loading frequency have been extensively studied and methodologies have been developed for "shifting" the properties obtained under different conditions in the laboratory to produce functions of loading frequency versus shear modulus or phase angle at reference temperatures. Furthermore, limits of linear viscoelastic behavior have been established in the laboratory for binders as a function of strain magnitude.

Despite the ability to characterize binders, there is a lag in understanding how they interact with the asphalt concrete microstructure to define asphalt concrete constitutive behavior. Widely used relationships between the stiffness of the binder and the stiffness of the asphalt concrete date back to the 1950's. The majority of the permanent deformation relationships are empirical in nature. Hence, there is a need to establish a link between the viscoelastic properties of binders, the microstructure of asphalt concretes and their combined effect on the macroscopic constitutive behavior of mixtures.

Although the technology for quantifying the viscoelastic properties of asphalt binders is well established, there is a limited fundamental understanding of how these properties interact with the asphalt concrete microstructure to define asphalt concrete constitutive behavior. The objective of this study is to establish a methodology for relating the viscoelastic properties of binders and the microstructure of asphalt concretes to their macrostructural constitutive behavior. It involves measurements of binder strains through imaging techniques, modeling their viscoelastic behavior, capturing the three-dimensional microstructure of asphalt concretes through X-ray CT, modeling its deformation under load through finite element techniques and verifying the developed models using field and laboratory observations.

ACADEMIC CREDIT: 6 - 12 credits

OUTPUT/PRODUCTS: Oral presentation and final report